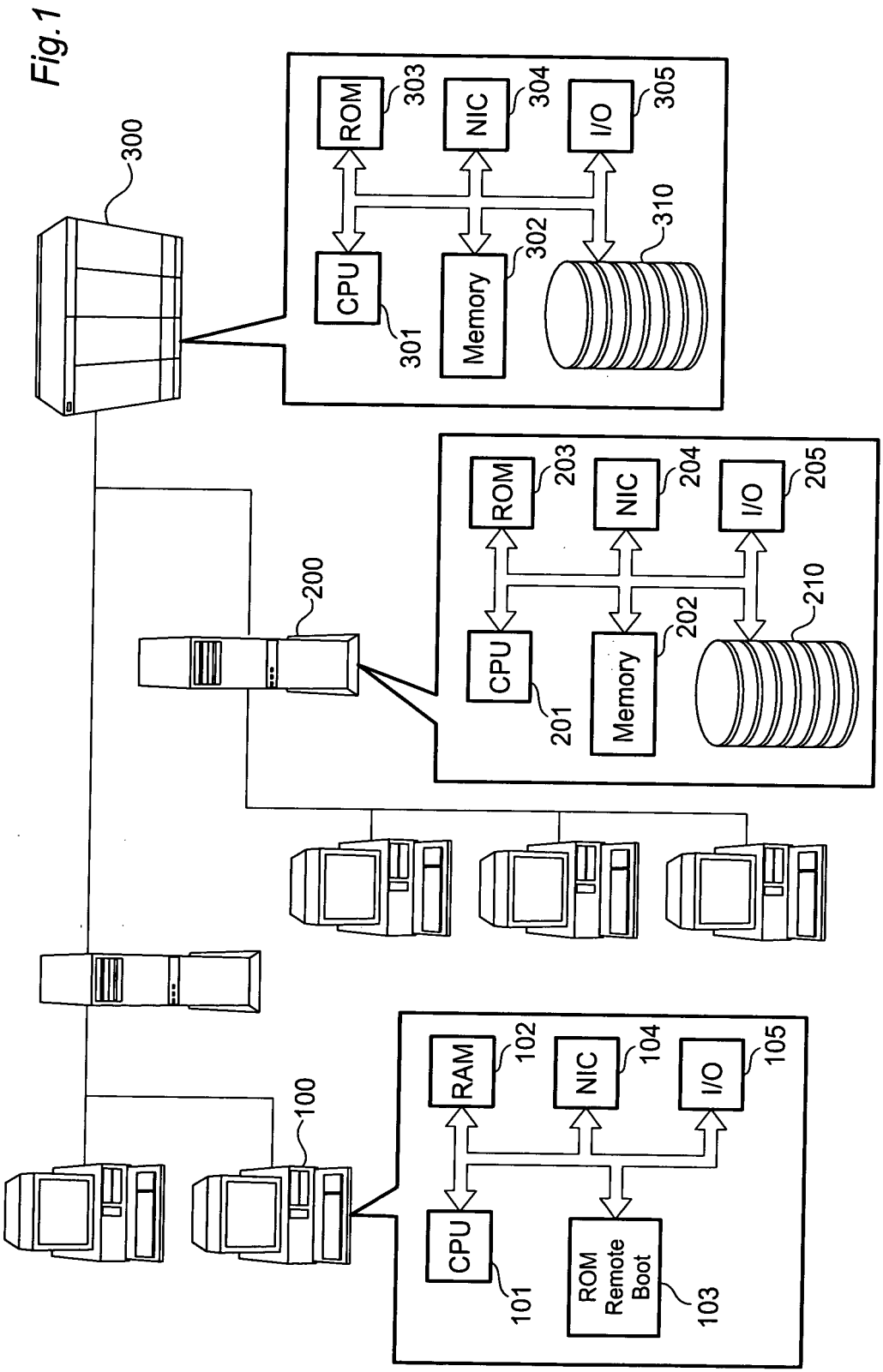
Fig.1


300
ROM
303
NIC
304
I/O
305
CPU
301
Memory
302
310
200
ROM
203
NIC
204
I/O
205
CPU
201
Memory
202
210
100
RAM
102
NIC
104
I/O
105
CPU
101
ROM
Remote
Boot
103

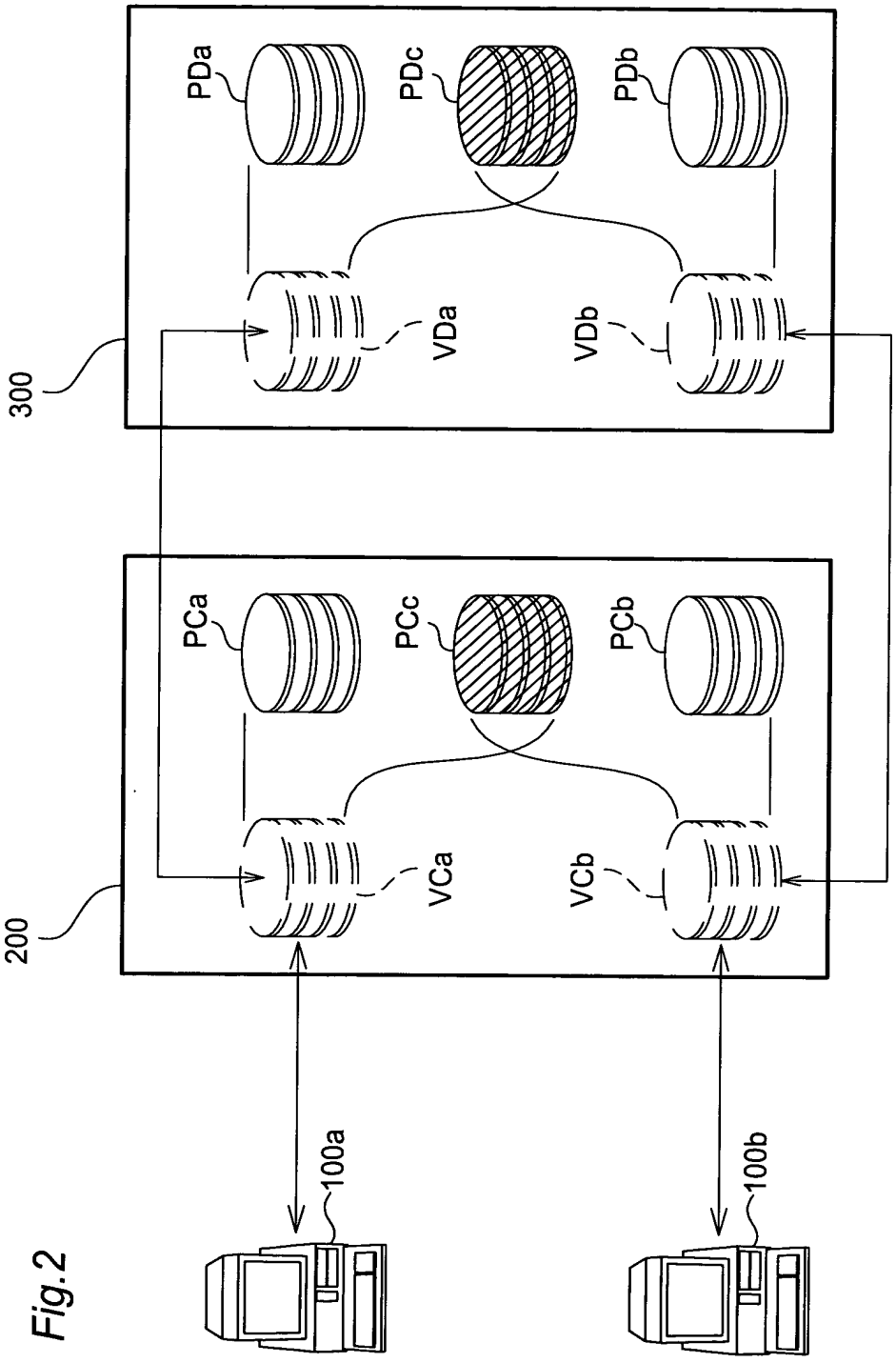


Fig.2

Fig.3

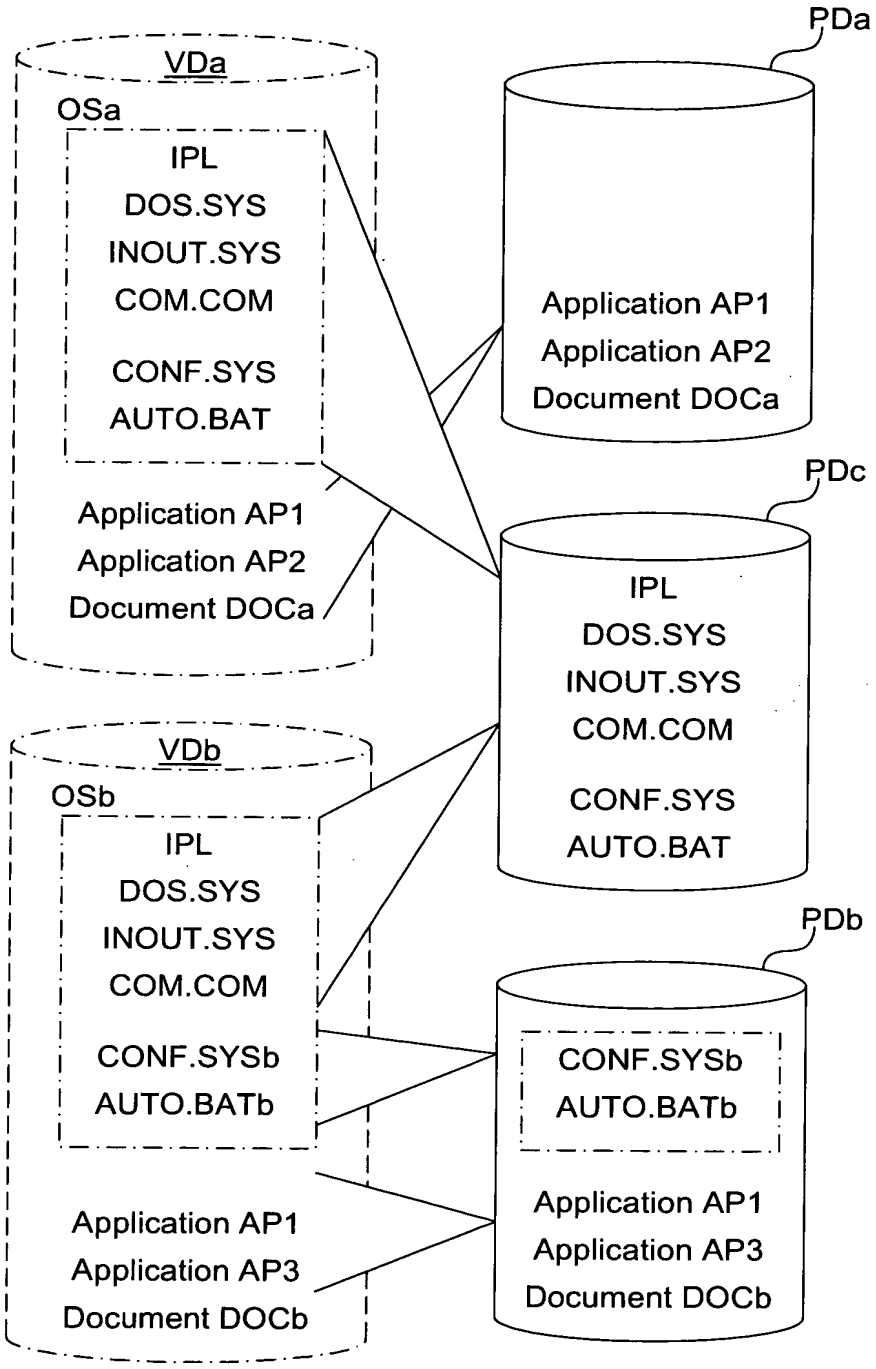
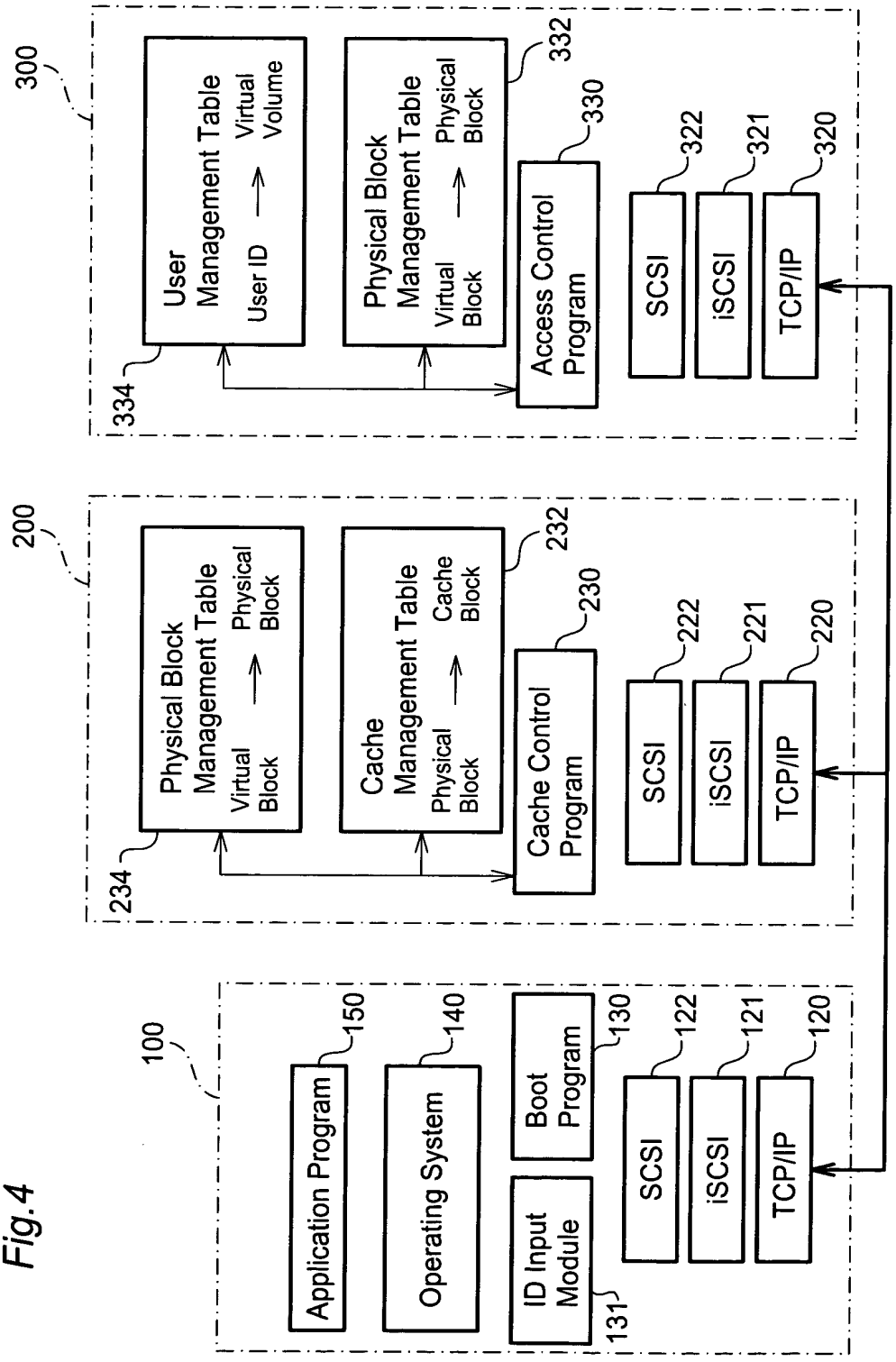

PDa
VDa
OSa
IPL
DOS.SYS
INOUT.SYS
COM.COM
CONF.SYS
AUTO.BAT
Application AP1
Application AP2
Document DOCa
Application AP1
Application AP2
Document DOCa
PDc
IPL
DOS.SYS
INOUT.SYS
COM.COM
CONF.SYS
AUTO.BAT
VDb
OSb
IPL
DOS.SYS
INOUT.SYS
COM.COM
CONF.SYSb
AUTO.BATb
PDb
CONF.SYSb
AUTO.BATb
Application AP1
Application AP3
Document DOCb
Application AP1
Application AP3
Document DOCb

Fig.4


300
User Management Table
User ID → Virtual Volume
Physical Block Management Table
Virtual Block → Physical Block
332
Access Control Program
330
SCSI
322
iSCSI
321
TCP/IP
320
334
200
Physical Block Management Table
Virtual Block → Physical Block
Cache Management Table
Physical Block → Cache Block
232
Cache Control Program
230
SCSI
222
iSCSI
221
TCP/IP
220
234
100
Application Program
150
Operating System
140
Boot Program
130
ID Input Module
131
SCSI
122
iSCSI
121
TCP/IP
120

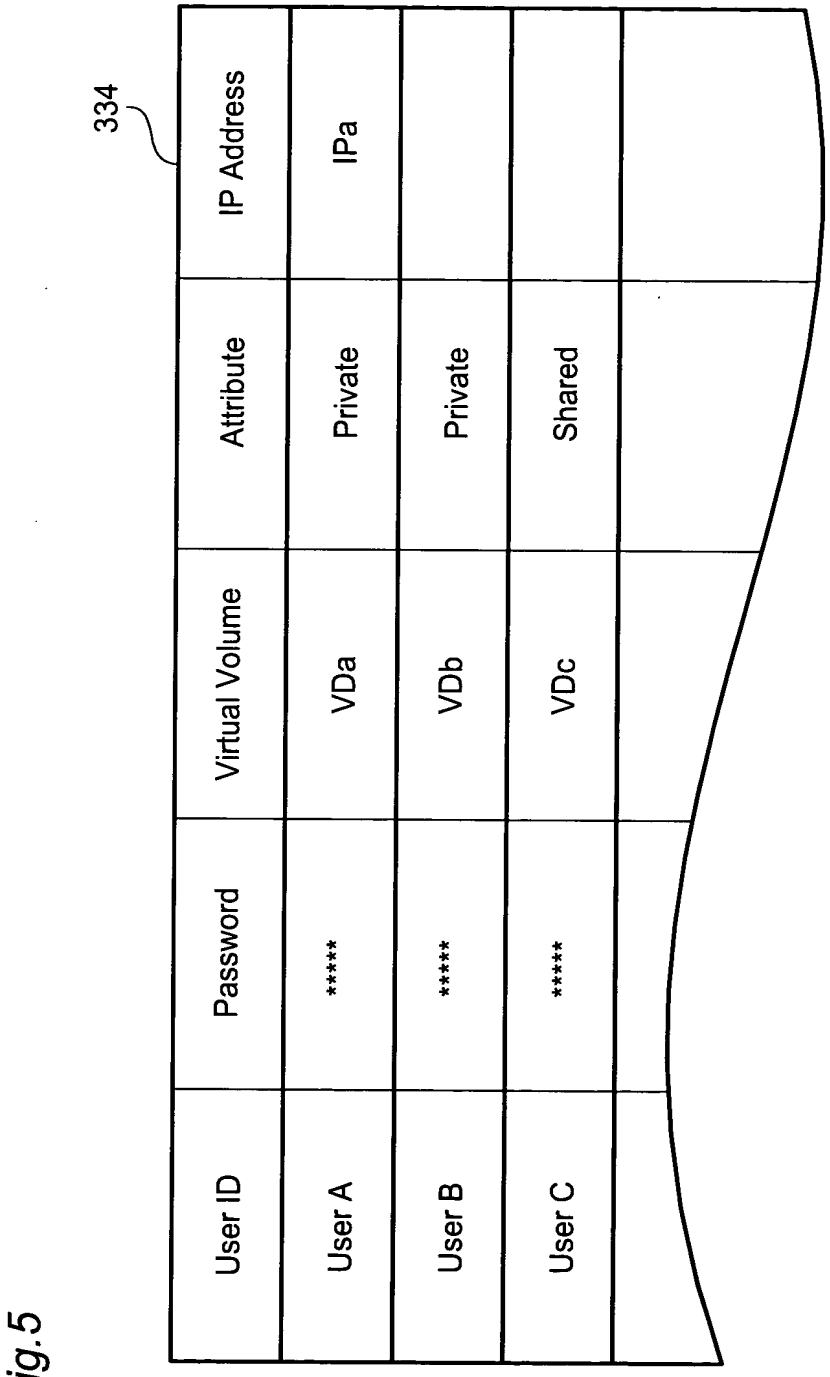
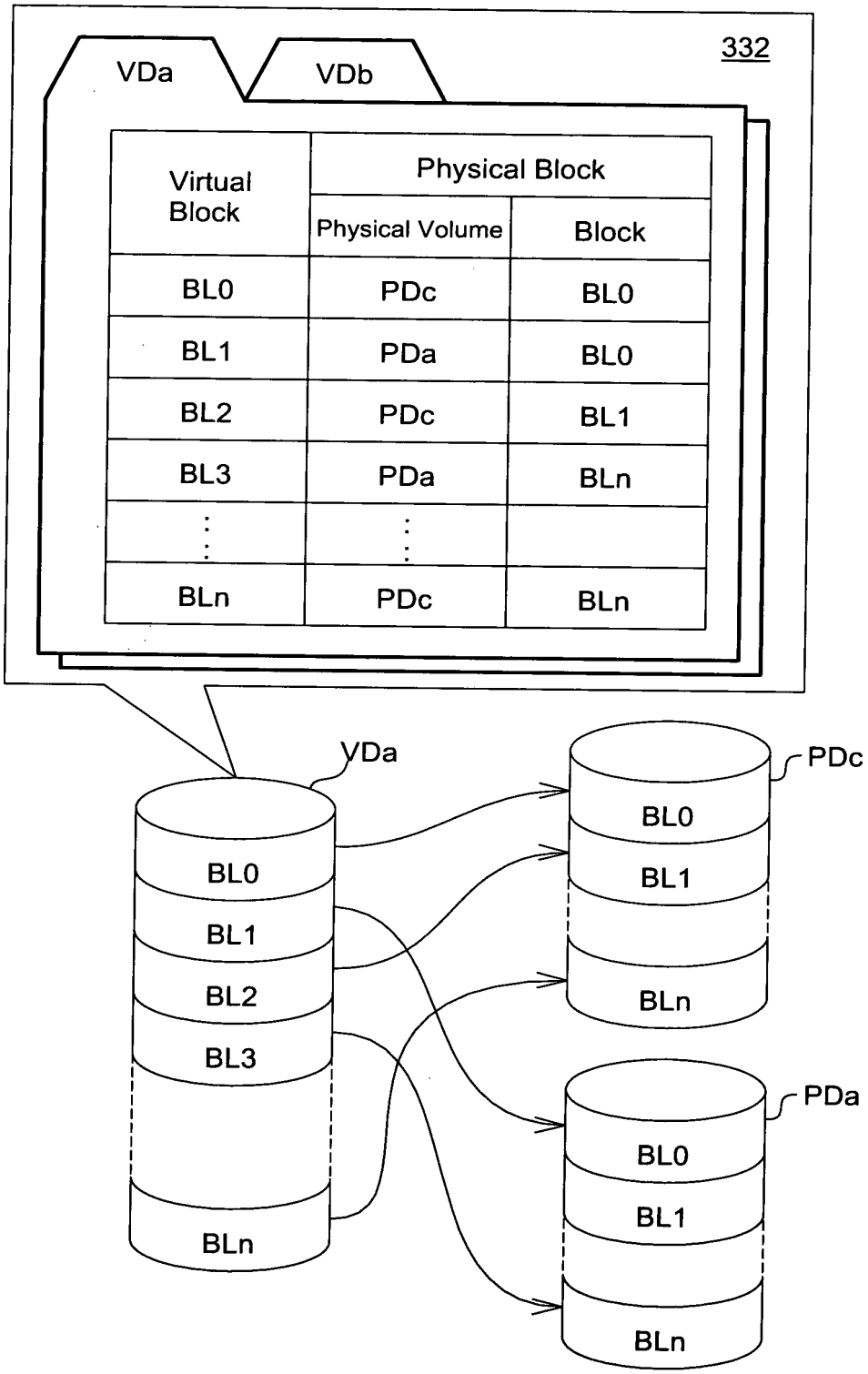

334
User ID
Password
Virtual Volume
Attribute
IP Address
User A
*****
VDa
Private
IPa
User B
*****
VDb
Private
User C
*****
VDc
Shared

Fig.5

Fig.6


332
VDa
VDb
Virtual Block
Physical Block
Physical Volume
Block
BL0
PDc
BL0
BL1
PDa
BL0
BL2
PDc
BL1
BL3
PDa
BLn
BLn
PDc
BLn
VDa
BL0
BL1
BL2
BL3
BLn
PDc
BL0
BL1
BLn
PDa
BL0
BL1
BLn

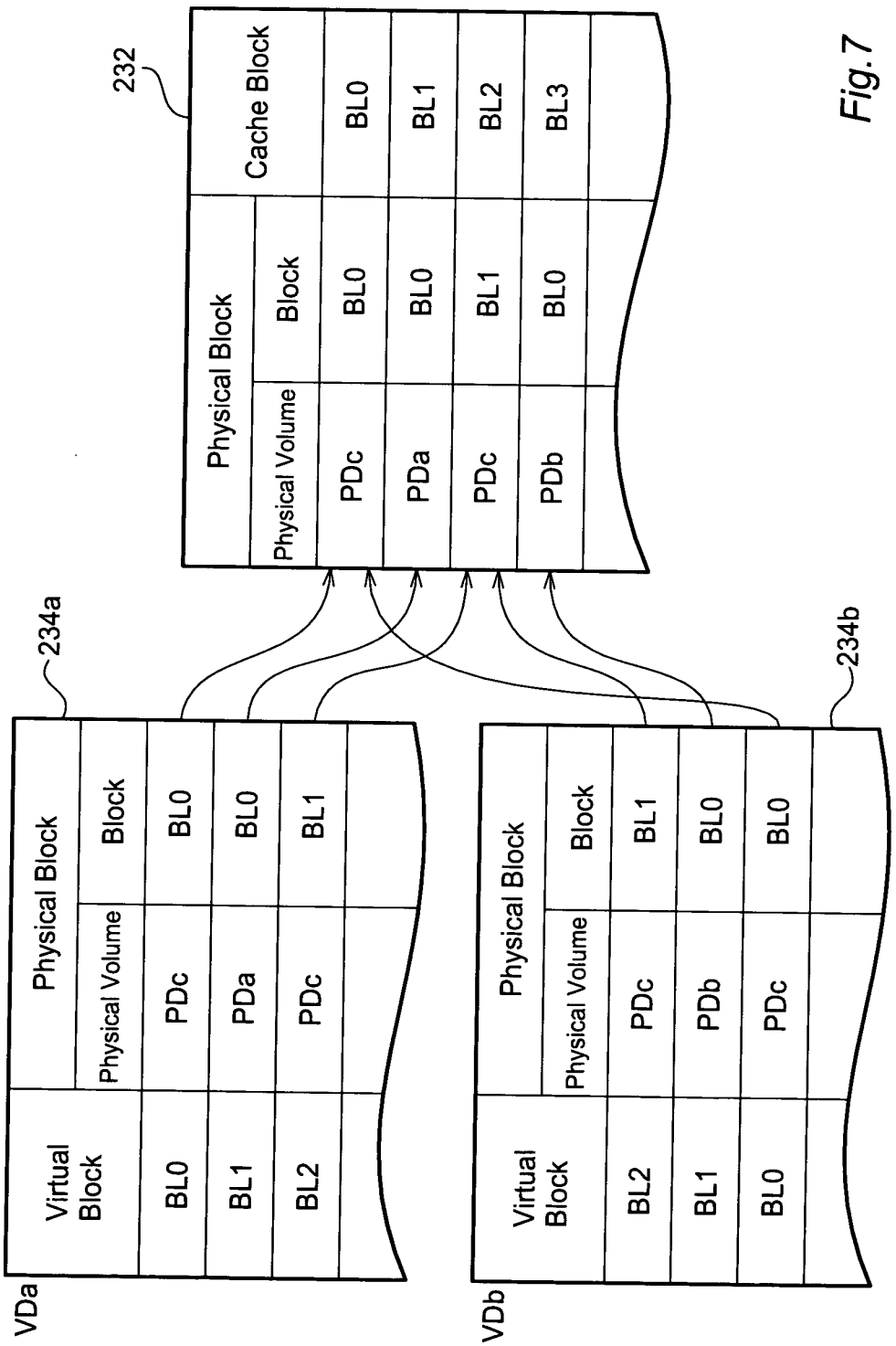
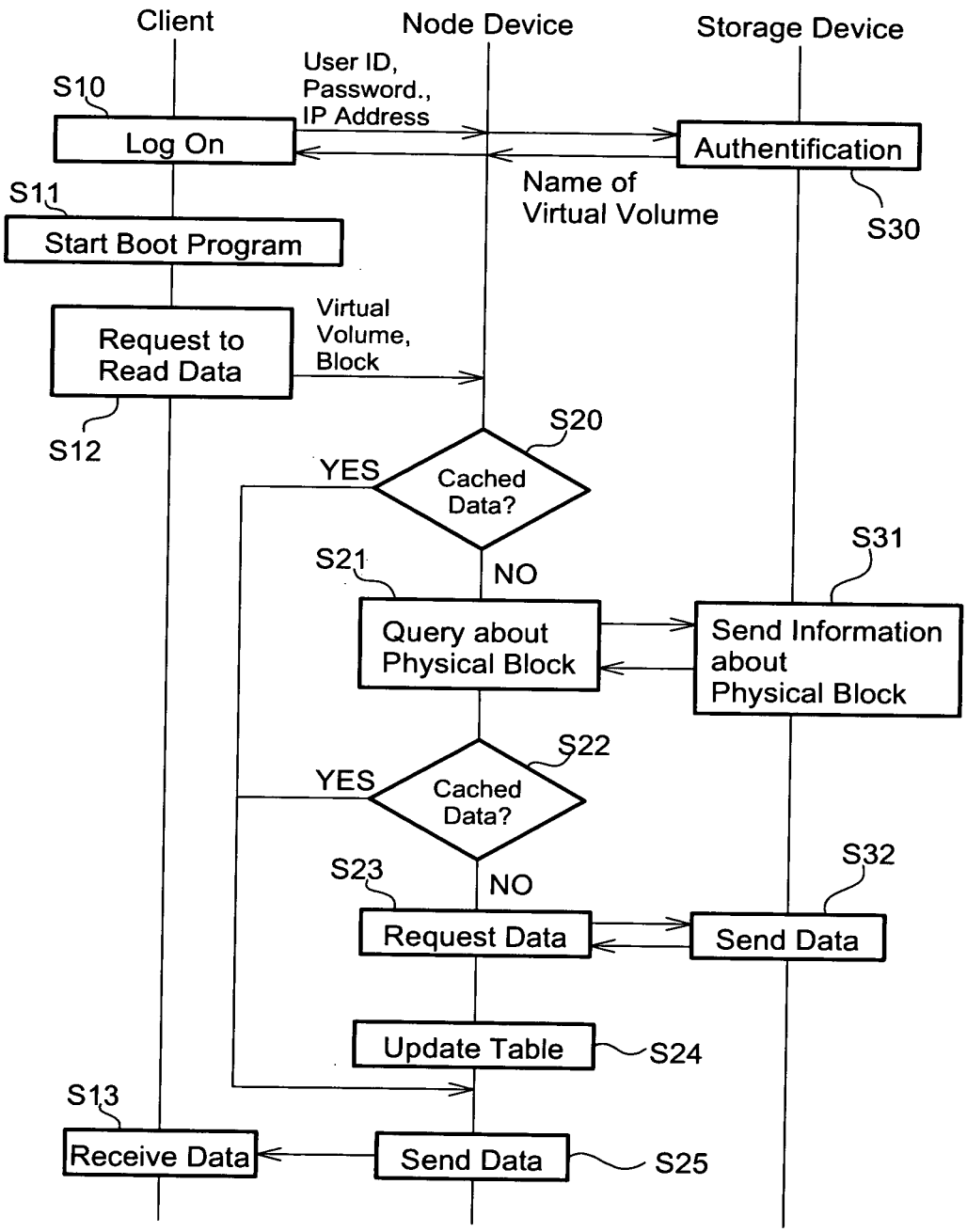

232
Cache Block
Physical Block
Physical Volume
Block
BL0
BL1
BL2
BL3
PDc
PDa
PDc
PDb
BL0
BL0
BL1
BL0
234a
234b
Virtual Block
VDa
VDb
BL0
BL1
BL2
PDc
PDa
PDc
BL0
BL0
BL1
BL2
PDc
PDb
PDc
BL1
BL0
BL0

Fig.7

Fig.8


Client
Node Device
Storage Device
S10
User ID,
Password.,
IP Address
Log On
Authentification
Name of
Virtual Volume
S30
S11
Start Boot Program
Request to
Read Data
Virtual
Volume,
Block
S12
S20
YES
Cached
Data?
S21
NO
S31
Query about
Physical Block
Send Information
about
Physical Block
S22
YES
Cached
Data?
S23
NO
S32
Request Data
Send Data
Update Table
S24
S13
Receive Data
Send Data
S25